

Durham Research Online

Deposited in DRO:

12 February 2020

Version of attached file:

Accepted Version

Peer-review status of attached file:

Peer-reviewed

Citation for published item:

Asutay, M. and Ayturk, Y. and Aksak, E. (2020) 'The effects of regulation and supervision on the risk-taking behaviour of Islamic banks.', *Journal of Islamic accounting and business research.*, 11 (9). pp. 1953-1967.

Further information on publisher's website:

<https://doi.org/10.1108/JIABR-12-2019-0222>

Publisher's copyright statement:

This article is made available under a Creative Commons Attribution Non-commercial International Licence 4.0 (CC BY-NC 4.0) and any reuse must be in accordance with the terms outlined by the licence.

Additional information:

Use policy

The full-text may be used and/or reproduced, and given to third parties in any format or medium, without prior permission or charge, for personal research or study, educational, or not-for-profit purposes provided that:

- a full bibliographic reference is made to the original source
- a [link](#) is made to the metadata record in DRO
- the full-text is not changed in any way

The full-text must not be sold in any format or medium without the formal permission of the copyright holders.

Please consult the [full DRO policy](#) for further details.

The Effects of Regulation and Supervision on the Risk-Taking Behaviour of Islamic Banks

Mehmet Asutay, Yusuf Ayturk and Ercument Aksak

Journal of Islamic Accounting and Business Research, 2020

DOI: 10.1108/JIABR-12-2019-0222

Professor Mehmet Asutay

Durham Centre for Islamic Economics and Finance
Durham University Business School
Durham University
Email: mehmet.asutay@durham.ac.uk

Dr Yusuf Ayturk

Department of Business Administration
Faculty of Political Sciences
Istanbul University
Email: yayturk@istanbul.edu.tr

Dr Ercument Aksak

Durham Centre for Islamic Economics and Finance
Durham University Business School
Durham University
Email: ercument.aksak@durham.ac.uk

Abstract:

Purpose: This study examines the impact of the regulatory and supervisory environment on the risk-taking behaviour of Islamic banks. The impact of the heterogeneous nature of the banking environment in the sampled countries is also considered.

Methodology: A dynamic panel data analysis with system GMM estimators was used with a sample consisting of 120 Islamic banks from 21 countries for the period of 2000-2013.

Findings: The results demonstrate that main regulation and supervision proxies have significant negative effects on risk levels of Islamic banks, which implies that further restricted regulatory and supervisory environment can lower risk levels of Islamic banks. In addition, the Islamic banks operating under the dual banking system seem to prefer to take a lower risk. Furthermore, the results identify that a stable political environment encourages Islamic banks to take higher risks in their operations.

Originality: In addition to examining the common factors, the empirical analysis in this study is extended to the investigation of the effects of several political indicators on risk-taking behaviour of Islamic banks, which should be considered as an important contribution.

Keywords: Risk-taking; Regulation; Supervision; Political and legal environment; Islamic banking.

JEL Classification: E44, G2, G18, Z1

1. Introduction

Well-functioning financial systems are considered as fundamental structures for economic growth and this relationship necessitates specific efforts to regulate and supervise the whole financial system, in particular banks as the key intermediaries. As part of such efforts, risky behaviour of banks is targeted to be limited by national authorities by developing and conducting sound regulatory and supervisory rules in the banking system, while a worldwide trend of deregulation in finance industry had been experienced prior to the recent global financial crisis. While such a flexible regulatory and supervisory environment increased the level of innovation in the industry, it has, at the same time, caused unethical and reckless financing practices in financial operations. Therefore, that liberal environment was blamed to be one of the main factors behind the crisis. Although Basel III Capital Accord had been finalized before the global financial crisis, the financial industry was exploiting the lax regulatory and supervisory environment during the deregulation period in the pre-crisis period. The global financial crisis, hence, has shown the importance of regulation and supervision in the financial industry. In responding to this, a new financial architecture has been initiated by national authorities, which was pioneered and coordinated under the tutelage of G20 Summits.

Although Islamic banking has grown into an international reality by moving from the periphery to the financial centres with double-digit growth rates, international financial architecture has recognised neither the existence nor importance of this sector. Islamic banking and financial institutions, which emerged in the mid-1970s, have become an essential part of the global financial system beyond the Muslim countries. While the total assets of Islamic banking, which is considered to be around USD 2 trillion (The Banker, 2014), still represents a very small fraction of the global financial system, their performance in particular during the recent global financial crisis has shifted attention to this sector, which is considered to be an ethical alternative financing method.

An essential distinguishing nature of Islamic banking is that their working rules and principles must be *Shari'ah* compliant or compliant with Islamic legal principles in general and financial rules in particular, which, among others, include prohibition of interest, and moderating uncertainty and speculation in financial transactions as well as prohibiting investment and financing in certain sectors which are considered harmful to human well-being. Hence, financial and sectorial screenings are constructed through the provision of *Shari'ah* resulting in specific *Shari'ah* compliant Islamic financing instruments or contracts.

Despite the strong development of Islamic banking industry, empirical studies, in general, have been limited on Islamic banking and finance, and in particular studies on the relationship between regulation and risk-taking have merely focused on conventional banking. This study, hence, shifts the focus on the Islamic banking sector with the aim of examining the impact of the regulatory and supervisory environment on the risk-taking behaviour of Islamic banks. In order to consider the characteristics of the regulatory environment of the financial system in the aftermath of the global financial crisis, the most recent bank regulation and supervision dataset of World Bank's 2011 survey was utilised. This study also considers the impact of the nature of the banking system on Islamic banks' risk-taking behaviour by classifying the jurisdictions from where the sample drawn as dual banking system and homogenous banking system jurisdiction. In the empirical analysis, a wide range of independent variables including political indicators were included in the estimation, which makes this study rather novel as such variables have not been examined for Islamic banks before.

The sample in this empirical study consists of 120 Islamic banks from 21 countries for the period of 2000-2013, providing a diverse profile. By using dynamic panel data analysis with system GMM estimators, this paper finds that strict regulatory and supervisory environment discourages Islamic banks from taking a higher risk in their operations. In other words, the findings evidence that there is a negative relationship between restricted regulatory and supervisory environment and risk-taking behaviour of Islamic banks. Another important finding is related to the relationship between the political environment and risk-taking behaviour of Islamic banks, as the results demonstrate that a more stable political environment encourages Islamic banks to take more risk in their operations. As for the impact of the regulative environment, this study finds that Islamic banks from the dual banking jurisdictions prefer to take lower risks compared to the Islamic banks operating under homogenous banking system dominated by conventional banking.

The remainder of this paper is organized as follows: Section two provides a literature review on regulation and risk-taking behaviour. In operationalizing the data, section three explains the dataset and empirical methodology conducted. Section four reports the findings on the effects of the regulatory and supervisory environment on the risk-taking behaviour of Islamic banks. The last section provides some implications and concludes this paper.

2. Literature Review

Regulatory and supervisory activities in the banking sector aim to maintain the bank's solvency and to protect customers and the public ultimately. Entry restrictions, capital requirements, deposit insurance, provisioning rules, supervision power, independence, disclosure requirements and restrictions on bank activities are amongst the commonly used regulatory and supervisory measures. Such precautionary measures affect risk-taking behaviours of individual banks with the objective of achieving overall financial stability. Hence, theoretical expectation suggests that strict regulatory and supervisory environment in the industry should lower the risk appetite of banks. However, the reasoning is not straightforward. Fonseca and Gonzalez (2010), therefore, conclude two opposing effects of regulation and supervision on risk-taking behaviour of banks: strict rules lead banks to hold less equity by reducing market discipline, and restrictions cause higher capital requirements by increasing market power.

The existing literature indicates that the relationship between the regulatory environment in the banking industry and risk-taking is mixed in the empirical literature. Gonzalez (2005), for example, finds a negative relationship between regulatory restrictions and risk-taking behaviour of conventional banks by using a dataset of 251 banks from 36 countries for the period of 1995-1999. In investigating the relationship between bank soundness and Basel Core Principles, Demirgüç-Kunt *et al.* (2008) identify a positive relationship between information provision and bank's financial strength, but other principles do not alter the banks' risk-taking behaviour. Similarly, Demirgüç-Kunt and Detragiache (2011) do not find any support for a relationship between effective supervision and risk. However, in examining the relationship between regulatory and supervision variables and bank ratings, Pasiouras *et al.* (2006) report the existence of a positive relationship between these two factors. Recently, Klomp and Haan (2012) have found that regulation and supervision in the conventional banking sector affect the risk-taking behaviour of high-risk banks only, which could not be located for low risk-banks.

Barth *et al.* (2004) critically discuss several policy aspects of the regulatory and supervisory environment for conventional banks and their impact on risk-taking behaviours of banks. The first regulatory policy area considered is 'restricting bank activities'. In practice, banks generally act as a financial intermediary, insurance broker or real estate investor. In summarizing as to why bank activities should be restricted by a regulatory authority, it is argued that diverse activities can lead to arising conflict of interest, moral hazard problems, increasing risk levels, monitoring issues, reduction in competition and efficiency. On the other

hand, if informational asymmetries are not significant, banks may exploit economies of scale and scope advantages by diversifying its operating areas, which, in return, may decrease riskiness of banks. Empirically investigating this relationship, Barth *et al.* (2004) found no significant relationship between restrictions on bank activities and risk proxy of non-performing loans to total assets ratio. On the contrary, Klomp and Haan (2012) have studied the effects of regulatory and supervisory factors on banking risk by differentiating 200 banks from 21 OECD countries into high and low-risk banks; consequently, they have found that regulatory rules on restricting bank activities reduce banking risk for only high-risk banks.

Regulations on ‘new bank entry restrictions’ are another facet of the regulatory and supervisory issue, as tighter regulations and rules on new bank entry can increase stability in the sector. On the other hand, restricting new bank entries can lead to monopolistic power to emerge in the industry, which can harm competition in the banking industry (Barth *et al.*, 2004: 210). However, Barth *et al.* (2004) found no relationship between the restriction on new bank entry and bank performance and stability. Similarly, Laeven and Levine (2009) found no relationship between entry restrictions and bank risk level.

The most conventional and widely used regulation method is ‘capital adequacy requirements’, which implies holding a certain level of capital as a buffer role against losses. As a regulatory tool, capital adequacy in banking affects risk-taking behaviour but the direction of the relationship has remained inconclusive following several empirical studies. For example, Konishi and Yasuda (2004) and Fernandez and Gonzalez (2005) find that high (strict) capital requirements reduce banking risk. Contrarily, Agoraki *et al.* (2011) report significantly weaker relationship; they also found that in some cases the relationship could even be reversed for banks with market power.

‘Deposit insurance scheme’ is another regulatory tool in banking. Although a higher level of deposit insurance discourages depositors from sudden withdrawals of their money in a possible crisis period and ensures financial stabilisation as a whole; theoretical expectations point out that deposit schemes may encourage higher risk-taking behaviours of individual banks. For example, Barth *et al.* (2004) in their multi-country study found no evidence for a positive relationship between higher deposit schemes and risk-taking behaviour.

In addition to the regulatory environment mentioned above, ‘supervisory activities of government and independent third parties’ are also considerably important for the well-

functioning banking industry. Theoretical expectation is that a strong official supervisory body can prevent excessive risk-taking behaviours of banks and ensure stability in the financial system (Barth *et al.*, 2004). Furthermore, ‘private monitoring’ is an alternative tool for supervision where some official supervisory agencies may require banks to be audited by an independent third party or to be rated by rating agencies. These private supervisory bodies force banks to prepare detailed information about bank activities and risk-management procedures and disclose them (Barth *et al.*, 2004).

As part of the new measures in controlling risk-taking behaviour in the new financial architecture, under the new financial regulatory rules, namely Basel III, which have appeared after the recent global financial crisis, risk-taking behaviour is aimed to be reduced during economic expansion periods and additional capital buffers are added for the negative effect of economic contractions. Another distinctive feature of new regulatory rules determined after the financial crisis is to have a systemic and macro-prudential perspective (Tressel and Verdier, 2014).

As regards to the regulative issues in Islamic financial sector, in practice, there are three main approaches to reflect the specific characteristics of Islamic banking on the financial regulatory framework (Song and Oosthuizen, 2014). The first approach argues that the regulatory framework of Basel III is sufficient for all financial institutions, conventional and Islamic alike, and thus there is no need to determine a set of specific rules for Islamic banks (Meija *et al.*, 2014). On the contrary, the second approach suggests an entirely independent set of rules is required for Islamic banking because of its specific features, mainly their Shari’ah compliance. The third approach incorporates these two approaches and supports the view that, while the Basel framework is adequate in general to regulate Islamic banks, some provisions are still required for Islamic banks, essentially in relation to their religious characteristics. The results of this study would indicate as to which approach is, in reality, more pervasive and deterministic in the Islamic banking industry.

It should be noted that Islamic Financial Services Board (IFSB), as an international standard-setting body, provides guidance to individual Islamic banks, national regulatory and supervisory authorities on how Islamic financial institutions should be regulated and supervised. With the aim of protecting the competitiveness of Islamic banking against conventional banking, IFSB has to take account of existing international regulatory standards of Basel III. Consequentially, this implies a regulatory and supervisory environment for Islamic

banks is being identical to those of conventional banks, which is criticised by a number of contenders. These critics emphasize two important points: compliance with Shari'ah rules and risk-return sharing principle.

Mejia *et al.* (2014) suggest that there is a need of a sound legal framework for regulation and supervision of Islamic banks in this development stage of the Islamic finance industry, as they claim that a single set of regulatory and supervisory environment, which encompasses both conventional and Islamic banking, should be conducted. In reflecting on the regulative practices in the Islamic finance sector, Song and Oosthuizen (2014) emphasize that regulatory practices for Islamic banking are divergent from one country to the other, because Islamic banking as a new alternative to conventional banking is still on its development stage. As a result, it can be concluded that in most of the countries, Islamic banks generally operate in the same regulatory and supervisory environment with conventional banks, while some countries, such as Malaysia, is keen to develop a distinct regulative environment for its Islamic banks and financial sector.

In the literature, supervision and regulation theory for conventional banking has sound theoretical backgrounds, which has gained further importance among scholars and professionals after the recent global financial crisis. Most of the empirical studies, therefore, focus on the conventional banking industry dataset. However, in diverging from this established trend, recently, Beck *et al.* (2013) have compared the risk levels of Islamic and conventional banks and have found that Islamic banks are more conservative in risk-taking behaviour in comparison to conventional banks. Alam (2013) has examined the case for Islamic banking for the relationships between efficiency, risk-taking, regulation and supervision for the period of 2006-2010, who found a negative relationship between risk-taking behaviour and regulatory and supervisory restrictions for Islamic banks, which implies that strict regulation and supervision reduce risk-taking behaviour of Islamic banks in terms of capital requirement and private monitoring.

The existing literature, on the other hand, implies an important gap about the effects of the regulatory and supervisory environment on the risk-taking behaviour of Islamic banks. Most of the available studies have only examined conventional banks, while previous studies on the Islamic banking sector has been limited both in scope and in number. Reflecting on this, this study shifts the focus on the Islamic banking industry, which is considered as a moral and ethical banking method. As a result, as explained in the introduction section, this study's main

motivation is to fill this gap by focusing on the impact of the regulatory and supervisory environment on the risk-taking appetite of individual Islamic banks.

3. Methodology and Data

Based on the theoretical and empirical studies discussed in the preceding section, the following empirical model is employed to investigate the relationship between risk-taking behaviour of Islamic banks and the regulatory environment:

$$bankingrisk_{ijt} = \alpha + \beta_1 bankingrisk_{ijt-1} + \beta_2 regulatoryenv_{jt} + \beta_3 X_{ijt} + \eta_t + \varepsilon_{i,t} + \varepsilon_{j,t} \quad (1)$$

where

$bankingrisk_{ijt}$ measures risk-taking behaviour of bank i in country j at year t . We included the first of lag of our dependent variable ($bankingrisk_{ijt-1}$) to construct a dynamic model, as suggested by Agoraki *et al.* (2011). $regulatoryenv_{jt}$ is a vector representing seven dimensions of regulatory and supervisory environment mentioned in the preceding section; X_{ijt} is a vector of all control variables rather than the regulatory and supervisory environment; η_t is time fixed effects; $\varepsilon_{i,t}$ and $\varepsilon_{j,t}$ are error terms for bank-level and country level respectively. We also include year dummy variables.

We use two measures for risk-taking behaviour of banks: (a) Z-score and (b) loan loss reserves/total gross loans ratio (LLR ratio). The Z-score is calculated as;

$$Z = (ROA + EA)/\sigma(ROA) \quad (2)$$

where ROA is the return on assets, EA is the ratio of equity to total assets and $\sigma(ROA)$ is the estimated standard deviation of return on assets.

Z-score is a widely used measure for estimating a bank's default probability (Agoraki *et al.*, 2011) and is negatively related to the probability of default for a bank. In other words, an the increase in Z-score represents lower risk-taking. However, our second risk-taking measure - LLR ratio- is positively related to the probability of default meaning that increase in LLR ratio represents higher risk-taking for banks. Among these two variables Z-score is more widely

used in the existing literature to measure bank risk-taking activities (Konishi and Yasuda, 2004; Agoraki *et al.*, 2011; Klomp and Haan, 2012; Beck *et al.*, 2013). Although it can be argued that LLR ratio is a backwards-looking measure of bank-level risk-taking, we have also examined it as the second measure in our analysis to achieve a more robust set of results.

In order to measure regulatory and supervisory environment in each country, we use World Bank's bank regulation and supervision database of 2001, 2004, 2007 and 2011 surveys (Barth *et al.*, 2001, 2004, 2008; Cihak *et al.* 2012). Following Klomp and Haan (2012). With the help of these databases, we construct the following 7 dimensions for the supervisory and regulatory environment of each country: activity restrictions, capital regulations, supervisory control, power of deposit-insurer, private monitoring, liquidity regulations and entry regulations (see Klomp and Haan, 2012, for calculation details of the indices for each dimension).

A number of control variables were included in the estimations, which may potentially affect the risk-taking behaviour of individual banks, which can be categorized into two broad groups: country-level variables and bank-level variables. The country-level variables include macroeconomic conditions, which can impact the behaviour of individual firms and the banking industry in the end. For example, adverse macroeconomic conditions can lead borrowing firms to become insolvent whereby economic shocks negatively affect the banking industry. As suggested by Klomp and Haan (2012) and Beck *et al.* (2006), we include several macroeconomic factors that can affect risk-taking behaviour in our sample. These macroeconomic control variables are: economic growth rate, inflation rate, change in the exchange rate, external debt, short-term real interest rate, changes in foreign exchange reserves, government surplus, net financial flows and ratio of M2 to foreign exchange reserves. In addition, as the second sub-section of country-level variables, political environment and the quality of legal system related variables are also included in the estimations, as they are also considered affecting the behaviour of individual banks as stated by Klomp and Haan (2012). We also considered political economy related variables such as measures of government stability, corruption, law and order and bureaucracy quality at country-level for each year based on the International Country Risk Guide database. Lastly, to capture the effects of bank-level control variables, we include bank size, number of subsidiaries, ownership structures measured by dummy variables for government ownership, foreign ownership and ownership concentration.

We obtained Islamic bank data from BankScope database. List of all variables used in this study and their descriptions are displayed in Table 1.

Table 1: List of Variables

Variable	Description	Source
Z-score	$Z = (ROA + EA)/\sigma(ROA)$	BankScope
LLR ratio	Loan Loss Reserves/Total Gross Loans	BankScope
Bank Size	Natural Logarithm of Total Assets	BankScope
Number of Bank's Subsidiaries	Number of Bank's Subsidiaries	BankScope
Foreign Ownership	Dummy variable, It is one if there is foreign ownership, zero otherwise	BankScope
Government Ownership	Dummy variable, It is one if there is government ownership, zero otherwise	BankScope
Ownership Concentration	Dummy variable, It is one if a shareholder owns more than 25% of the bank, zero otherwise	BankScope
Activity Restrictions	Index based on World Bank's bank regulation and supervision surveys	DataStream
Capital Regulations	Index based on World Bank's bank regulation and supervision surveys	DataStream
Supervisory Control	Index based on World Bank's bank regulation and supervision surveys	DataStream
Power of Deposit Insurer	Index based on World Bank's bank regulation and supervision surveys	DataStream
Private Monitoring	Index based on World Bank's bank regulation and supervision surveys	DataStream
Liquidity Regulations	Index based on World Bank's bank regulation and supervision surveys	DataStream
Entry Regulations	Index based on World Bank's bank regulation and supervision surveys	DataStream
Current Account Balance	Current account balance as percentage of GDP	DataStream
Inflation Rate	Annual change in consumer price index	DataStream
Economic Growth	Annual growth rate of GDP	DataStream
Exchange Rate Depreciation	Annual depreciation rate of the official exchange rate	DataStream
External Debt	Year-end total external debt (US dollars)	DataStream
Term of Trade Shocks	Standard deviation of terms of trade shocks index	DataStream
Real Interest Rate	Short term interest rate less inflation rate	DataStream
Interest Rate Differential	Short term interest rate less world interest rate (Germany, United States and Japan)	DataStream
Net Financial Flows	Year-end net capital outflow	DataStream
M2 to Foreign Exchange Reserves	Year-end M2 to foreign exchange reserves	DataStream
Government Surplus	Government net revenue/spending to GDP	DataStream
Government Stability	Year-end government stability index	ICRG
Corruption	Year-end corruption index	ICRG
Law and Order	Year-end law and order index	ICRG
Bureaucracy Quality	Year-end bureaucracy quality index	ICRG

As can be seen in Table 2, the sample consists of 120 Islamic banks from 21 countries over the period 2000-2013, which also includes the most recent bank regulation and supervision survey of 2011. We include all Islamic banks under the BankScope's Islamic bank specification and having at least 2 years of consecutive financial data. The number of Islamic banks and observations are reported in Table 2. Table 3 reports the summary statistics of all variables across countries.

Table 2: Number of Islamic banks and observations across countries

Country	Banks	Observation
Bahrain	22	177
Bangladesh	6	19
Egypt	3	31
Indonesia	10	49
Jordan	3	31
Kuwait	11	83
Lebanon	3	13
Malaysia	18	62
Oman	2	4
Pakistan	8	45
Philippines	1	7
Qatar	5	36
Singapore	1	7
South Africa	1	10
Thailand	1	12
Tunisia	1	14
Turkey	4	25
UAE	10	84
UK	5	37
Tanzania	1	3
Yemen	4	36
Total	120	785

4. Analysis and the Findings

In this section, we estimate our dynamic econometric model to investigate the relationship between regulatory and supervisory environment and risk-taking behaviour of Islamic banks. To estimate the model in equation 1, we use Blundell and Bond (1998)'s GMM estimators to deal with possible endogeneity problem between risk-taking measures and regulatory and supervisory indicators. Table 4 depicts empirical results for two different dependent variables: Model 1 represents the empirical model with Z-score as a risk measure for Islamic banks, while Model 2 includes loan loss reserves/total gross loans (LLR ratio) as a risk measure.

The main hypothesis in this study that is 'high level of banking regulation and supervision reduces risk-taking behaviour of Islamic banks', is developed in the preceding sections. As depicted in Table 4, the majority of our variables are statistically significant and supporting the directions of our hypotheses with expected signs. Moreover, lagged dependent variables in the model are also statistically significant which confirms the suitability of dynamic models for empirical analysis in this kind of research setting. Analysing the bank-level determinants of risk-taking, the results indicate that bank size and foreign ownership are statistically significant in both models. In other words, the results suggest that bank size and foreign ownership reduce the risk levels of Islamic banks. On the other hand, government ownership increases risk-taking levels of Islamic banks with statistically significant levels.

Table 3: Summary statistics (mean) across countries

Country	BA	BH	EY	IN	JO	KU	LB	MY	OM	PK	PH	QA	SI	SA	TH	TU	TK	UEA	UK	TA	YE
Z-score	12.0	45.2	12.1	53.3	23.1	17.1	18.3	65.9	27.5	37.8	-2.7	26.5	14.5	41.8	4.6	41.5	27.8	17.3	14.8	11.9	19.6
LLR ratio	0.1	0.0	0.2	0.0	0.0	0.1	0.3	0.0	0.0	0.0	0.4	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.2	0.0	0.1
Bank Size	13.3	14.4	14.6	13.4	14.0	14.6	11.7	15.1	12.8	11.5	9.1	15.2	13.1	12.6	12.9	12.7	15.6	15.3	12.3	10.3	12.4
Subsidiaries	13.2	2.3	22.8	0.4	14.5	20.4	0.2	1.5	0.0	2.1	0.0	21.2	1.0	1.0	0.0	2.0	11.8	18.8	5.1	0.0	1.8
Foreign Ownership	0.4	0.3	0.5	0.3	0.5	0.4	0.5	0.4	0.0	0.4	0.0	0.5	0.0	1.0	0.0	1.0	0.7	0.1	0.8	0.0	0.0
Government Ownership	0.1	0.0	0.9	0.0	0.5	0.7	0.0	0.0	0.5	0.0	0.0	0.9	0.0	0.0	1.0	0.0	0.6	0.4	0.4	0.0	0.0
Ownership Concentration	0.6	0.5	1.0	0.9	1.0	0.8	0.7	0.9	0.5	0.8	0.0	0.7	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0	0.5
Activity Restrictions	2.2	3.3	2.9	2.8	2.8	2.2	2.6	2.8	2.5	2.6	1.7	2.6	1.8	2.5	3.0	2.3	2.3	2.4	1.2	1.5	2.0
Capital Regulations	0.6	0.6	0.4	0.6	0.6	0.7	0.7	0.5	0.6	0.7	0.8	0.8	0.9	0.7	0.7	0.4	0.6	0.5	0.7	0.5	0.7
Supervisory Control	0.9	0.6	0.9	0.9	0.8	0.6	0.7	0.7	0.9	0.9	0.9	1.0	0.9	0.6	0.8	0.7	0.9	0.6	0.6	0.9	1.0
Power of Deposit Insurer	0.1	0.6	0.0	0.5	0.4	0.0	0.0	0.6	0.0	0.3	0.9	0.0	0.3	0.0	0.1	0.3	0.3	0.0	0.3	0.3	0.0
Private Monitoring	0.7	0.8	0.6	0.8	0.7	0.6	0.6	0.8	0.8	0.9	0.9	0.9	0.8	0.7	0.7	0.6	0.6	0.5	0.8	0.5	1.0
Liquidity Regulations	0.5	0.9	0.8	0.7	0.8	0.5	0.7	0.8	0.8	0.6	0.7	0.9	0.4	0.5	0.6	0.4	0.5	0.6	0.4	0.6	0.8
Entry Regulations	0.1	0.0	0.4	0.4	0.4	0.3	0.0	0.2	0.8	0.0	0.8	0.4	0.0	0.2	0.2	0.0	0.2	0.1	0.0	0.5	0.5
Current Account Balance	0.1	-0.1	0.0	0.0	-0.1	0.1	-0.1	0.1	0.1	0.0	0.0	0.2	0.2	0.0	0.0	0.0	-0.1	0.1	0.0	-0.1	0.0
Inflation Rate	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.1	0.1
Economic Growth	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
Exchange Rate Depreciation	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
External Debt (Billion US dollars)	33	1	34	205	15	35	26	179	4	51	60	59	1,070	88	83	20	303	104	9,508	12	6
Term of Trade Shocks	7.3	19.5	14.5	16.6	9.2	39.8	3.7	1.6	58.6	17.0	13.1	44.4	7.0	4.4	4.9	3.2	4.8	24.9	1.6	18.1	21.0
Real Interest Rate	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1
Interest Rate Differential	0.0	0.1	0.1	0.1	0.1	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Net Financial Flows (Million US dollars)	-1,818	261	-2,897	3,685	1,141	-35,605	5,389	4,581	-5,877	1,152	-2,180	0	-47,103	3,928	368	649	31,031	0	-67	2	1
M2 to Foreign Exc. Res.	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.6	-0.1	0.0
Government Surplus	0.0	-0.1	-0.1	0.0	-0.1	0.2	-0.1	0.0	0.0	-0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.2	0.2
Government Stability	0.7	0.5	0.7	0.6	0.8	0.7	0.6	0.5	0.8	0.6	0.6	0.9	0.9	0.6	0.6	0.8	0.7	0.9	0.6	0.8	0.8
Corruption	0.4	0.5	0.3	0.4	0.5	0.5	0.2	0.4	0.4	0.3	0.3	0.4	0.8	0.4	0.3	0.4	0.4	0.4	0.7	0.4	0.3
Law and Order	0.8	0.3	0.6	0.5	0.7	0.8	0.7	0.7	0.8	0.5	0.4	0.8	0.8	0.4	0.5	0.8	0.7	0.7	0.9	0.8	0.3
Bureaucracy Quality	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.8	0.5	0.5	0.8	0.5	1.0	0.5	0.5	0.5	0.5	0.8	1.0	0.3	0.3

Parallel to the discussion above, the focus of this study is regulatory and supervisory indices; thus, the main variables of the model presented in Table 4 relates to regulatory and supervisory indices. In this group of variables, the first measure is ‘activity restrictions index’, showing regulations on banks’ operating activities. The results in relation to Model 1 indicate that regulations on banks’ allowed activities are positively related to Z-score, which implies that restricting banks’ allowed activities decrease risk-taking levels of Islamic banks and lead to higher Z-scores. In other words, the results suggest that a 1% increase in activity restrictions index leads to 2.15 increase in Z-score of average Islamic bank in our sample. However, there is no statistically significant relationship between LLR ratio and activity restrictions index in Model 2.

The results indicate that the second regulatory dimension investigated in this empirical analysis being ‘capital regulations’ decreases risk-taking behaviour of Islamic banks at statistically significant levels (the coefficients are 5.25 and -0.14 respectively). From the perspective of regulatory agencies, it can be concluded that capital regulations are effective measures to discourage Islamic banks from taking more risks. Thus, the findings in this study on capital regulations are consistent with Klomp and Haan (2012) and Alam (2013).

Despite the fact that, in theory, a significant relationship between supervisory environment and risk-taking behaviour can be expected, the coefficients of ‘supervisory control’ dimension of our analysis are not statistically different than zero in both the models. Hence, no relationship between the level of supervisory control activities and risk-taking behaviour of the sampled Islamic banks could not be found. The results are consistent with the earlier findings of Barth *et al.* (2004) and Alam (2013) for this measure.

The coefficient of ‘power of deposit-insurer’ is not statistically significant in Model 1, but the coefficient of the second model is statistically significant and positive. As the results in table 4 demonstrate, a statistically significant positive relationship is established at 1% level between the power of deposit-insurer and risk-taking behaviour of Islamic banks in our sample. These results imply that a more powerful deposit insurance scheme encourages Islamic banks to take more risk measured by LLR ratio.

Table 4: Estimation Results

	Model 1 (Z-score)	Model 2 (LLR ratio)
Lagged dependent variable	0.80 (106.35)***	0.68 (42.61)***
<i>Bank-Level Variables</i>		
Bank Size	0.74 (7.16)***	-0.02 (-14.98)***
Number of Bank's Subsidiaries	-0.01 (-0.46)	0.00 (6.02)***
Foreign Ownership	0.57 (1.72)*	-0.01 (-3.44)***
Government Ownership	-1.41 (-4.18)***	0.02 (5.54)***
Ownership Concentration	-0.06 (-0.23)	-0.02 (-4.46)***
<i>Regulatory and Supervisory Variables</i>		
Activity Restrictions	2.15 (8.54)***	-0.01 (-1.18)
Capital Regulations	5.25 (8.27)***	-0.14 (-8.88)***
Supervisory Control	-8.21 (-1.25)	0.01 (0.67)
Power of Deposit Insurer	-0.23 (-0.39)	0.05 (3.73)***
Private Monitoring	8.08 (6.24)***	-0.03 (-1.60)
Liquidity Regulations	8.82 (13.49)***	-0.01 (-0.86)
Entry Regulations	4.51 (8.76)***	-0.03 (-2.54)**
<i>Macroeconomic Variables</i>		
Current Account Balance	-4.28 (-3.31)***	0.06 (1.99)**
Inflation Rate	5.75 (2.70)***	0.28 (11.03)***
Economic Growth	-13.73 (-12.69)***	-0.18 (-7.76)***
Exchange Rate Depreciation	2.71 (2.95)***	-0.02 (-1.61)
Term of Trade Shocks	-0.12 (-11.06)***	0.00 (2.38)**
Real Interest Rate	-3.63 (-4.87)***	0.01 (0.68)
Interest Rate Differential	-19.29 (-7.59)***	-0.23 (-6.84)***
Net Financial Flows	0.00 (-3.16)***	0.00 (0.80)
M2 to Foreign Exchange Reserves	-13.24 (-12.84)***	0.09 (3.94)***
Government Surplus	-1.25 (-0.90)	0.12 (11.91)***
<i>Political and Institutional Variables</i>		
Government Stability	-4.76 (-6.01)***	0.07 (5.91)***
Corruption	-3.56 (-5.23)***	0.15 (6.74)***
Law and Order	8.31 (9.29)***	-0.11 (5.75)***
Bureaucracy Quality	8.08 (6.13)***	-0.07 (-3.69)***
Year Dummies	Included	Included
Constant	-18.09 (-8.84)***	0.34 (8.93)***
Number of Banks	120	101
Observations	663	487
Wald Test (p-value)	0.00	0.00
AR(1) (p-value)	0.00	0.02
AR(2) (p-value)	0.44	0.65
Sargan Test (p-value)	0.95	0.94

Notes: Wald test indicates overall goodness of fit for models. AR(1) and AR(2) are Arellano-Bond tests for autocorrelation. Sargan test is to test for over-identifying restrictions. *t*-statistics are reported in parentheses. ***, ** and * indicates significance levels of 1%, 5% and 10% respectively.

As regards to the proxy for ‘private monitoring’ in the banking industry, it has a positive and significant coefficient in Model 1 referring to a positive relationship between Z-score and risk-taking. This implies that better private monitoring in the industry decreases risk levels of Islamic banks. However, no relationship can be found between private monitoring and risk-taking behaviour of Islamic banks in the second model including the LLR ratio as a risk measure. Similarly, according to Model 1 results, ‘liquidity regulations’ are effective to control risk-taking in the Islamic banking industry. This proxy has a statistically significant and positive coefficient of 8.82 meaning that a 1% increase in liquidity regulations index increases Z-score of a representative Islamic bank by 8.82 points. However, no statistically significant relationship between liquidity regulations and LLR ratio of Islamic banks can be found. As for the proxy of ‘market entry regulations’, it has statistically significant coefficients in both models (the coefficients are 4.51 and -0.03 at 1% and 5% levels, respectively). Hence, as the results indicate, restrictions on new bank entry reduce risk levels of Islamic banks.

Overall, the empirical results prove that the regulatory and supervisory environment in 21 countries affects the risk-taking behaviour of Islamic banks. In addition, as the findings evidence, strict activity restrictions, capital regulations, private monitoring, liquidity regulations and market entry regulations lower risk-taking levels of Islamic banks.

Since the empirical analysis in this study is extended to the investigation of the effects of several political indicators on risk-taking behaviour of Islamic banks, the results indicate that increased higher stability and lower corruption at country-level encourage Islamic banks to take more risk. In other words, a more stable political environment and better institutional structures increase risk levels of Islamic banks. Secondly, ‘law and order’ and ‘bureaucratic quality’ are also proven to be effective in regulating the risk-taking behaviour of Islamic banks.

In the sample of Islamic banks utilised in this study, most of the countries operate dual banking system in which Islamic banks operate under a unique set of rules different than conventional banks. However, some other countries locate Islamic banks within the conventional banking system, where Islamic banks must operate under the same set of rules with conventional banks. The dual banking system with more accommodating rules for Islamic banks may significantly and positively affect the performance and risk-taking behaviour of banks. For example, Mohammed *et al.* (2018) examine the case of Malaysian dual banking system and find that the degree of competition among Islamic banks is higher than conventional banks.

Table 5: Estimation Results with dual banking system dummy variable

	Model 3 (Z-score)	Model 4 (LLR ratio)
Lagged dependent variable	0.81 (75.48)***	0.66 (42.61)***
<i>Bank-Level Variables</i>		
Bank Size	0.73 (5.99)***	-0.02 (-10.89)***
Number of Bank's Subsidiaries	-0.01 (-0.70)	0.00 (4.95)***
Foreign Ownership	0.52 (1.48)	-0.01 (-2.11)**
Government Ownership	-1.36 (-4.05)***	0.03 (5.03)***
Ownership Concentration	-0.01 (-0.05)	-0.02 (-2.31)**
<i>Regulatory and Supervisory Variables</i>		
Activity Restrictions	1.85 (5.41)***	-0.01 (-2.31)**
Capital Regulations	6.04 (8.89)***	-0.18 (-6.53)***
Supervisory Control	-7.74 (-6.37)***	0.02 (1.55)
Power of Deposit Insurer	-0.28 (-0.35)	0.05 (3.42)***
Private Monitoring	7.37 (5.25)***	-0.01 (-0.28)
Liquidity Regulations	9.68 (13.14)***	-0.03 (-1.92)*
Entry Regulations	5.02 (9.51)***	-0.01 (-0.77)
<i>Macroeconomic Variables</i>		
Current Account Balance	-6.94 (-5.12)***	-0.02 (-0.82)
Inflation Rate	5.73 (2.63)***	0.16 (4.19)***
Economic Growth	-14.15 (-9.56)***	-0.20 (-8.51)***
Exchange Rate Depreciation	1.39 (1.19)	-0.06 (-2.71)
Term of Trade Shocks	-0.14 (-8.31)***	0.00 (1.86)*
Real Interest Rate	-4.09 (-5.80)***	0.03 (1.05)
Interest Rate Differential	-22.85 (-8.10)***	-0.36 (-7.57)***
Net Financial Flows	0.00 (-3.01)***	0.00 (-2.82)***
M2 to Foreign Exchange Reserves	-9.71 (-4.38)***	0.23 (3.43)***
Government Surplus	0.01 (0.01)	0.18 (11.48)***
<i>Political and Institutional Variables</i>		
Government Stability	-3.89 (-4.84)***	-0.01 (-0.99)
Corruption	-3.25 (-3.31)***	0.18 (8.10)***
Law and Order	7.55 (9.28)***	0.05 (2.80)***
Bureaucracy Quality	8.64 (5.71)***	-0.11 (-5.55)***
Dual Banking System Dummy	1.08 (1.90)*	-0.06 (-8.23)***
Year Dummies	Included	Included
Constant	-23.56 (-9.56)***	0.43 (9.20)***
Number of Banks	120	101
Observations	663	487
Wald Test (p-value)	0.00	0.00
AR(1) (p-value)	0.00	0.03
AR(2) (p-value)	0.46	0.71
Sargan Test (p-value)	0.93	1.00

Notes: Wald test indicates overall goodness of fit for models. AR(1) and AR(2) are Arrelano-Bond tests for autocorrelation. Sargan test is to test for over-identifying restrictions. *t*-statistics are reported in parentheses. ***, ** and * indicates significance levels of 1%, 5% and 10% respectively.

In responding to the distinction between the dual banking system and solo or only conventional banking system, World Bank's bank regulation and supervision surveys do not measure favourable banking environment of a country for Islamic banks. To investigate the effect of the dual banking system on risk-taking behaviour of Islamic banks, we estimate our models with an additional dummy variable, namely 'dual banking dummy variable', which is '1' if a country has a developed dual banking system and '0' otherwise. By adding a dual banking system dummy variable, we aim to control the effects of a more favourable regulatory environment for Islamic banks. Following Alam (2012), countries with the developed dual banking system in our sample include Egypt, Bahrain, Bangladesh, Indonesia, Kuwait, Malaysia, Pakistan, Qatar, Turkey, and the UAE, while the remaining countries are classified operating only conventional banking system.

Table 5 presents the results of the additional analysis with dual banking system dummy variable, which demonstrates that the additional dummy variable has statistically significant coefficients for both of model 3 and model 4. The positive coefficient of Z-score model and negative coefficient of LLR ratio model imply a negative relationship between risk-taking and the dual banking system. In other words, Islamic banks operating in the dual banking system prefer to take lower risk compared to Islamic banks operating under the conventional banking system.

5. Conclusions

The recent global financial crisis has demonstrated the importance of regulatory and supervisory bodies in the financial system. Consequently, an increasing number of academic researches has stemmed from the literature investigating this relationship between the regulations and behaviour of financial institutions, especially in terms of risk appetite. However, the existing literature on the relationship between regulation, supervision and risk-taking is mainly limited to the studies examining conventional banking industry, neglecting an important and growing branch of the financial services industry, namely Islamic banking. Responding to this gap in the literature, this study explored and examined the relationship between regulation and supervision levels and risk-taking behaviour of Islamic banks. Benefiting from the rich literature on conventional banking, the regulatory and supervisory indicators at country-level were constructed to estimate a dynamic empirical model. Additionally, a wide range of independent variables was included in our econometric model to capture a broader perspective of political, macroeconomic and bank-specific determinants on risk-taking behaviour.

The most important findings of this study are that the supervisory and regulatory dimensions of activity restrictions, capital regulations, private monitoring, liquidity regulations and market entry regulations in the banking industry have deterrent effects on risk-taking behaviour of Islamic banks. Overall, it can be concluded that the regulation and supervision in banking industry is beneficial to control risk-taking behaviour of Islamic banks and to strengthen the financial stability of Islamic banking industry as a whole.

In practice, there are three main approaches to reflect the specific characteristics of Islamic banking on the financial regulatory framework (Song and Oosthuizen, 2014): The first approach argues that the regulatory framework of Basel III is sufficient for all financial institutions, conventional and Islamic alike, and thus there is no need to determine a set of specific rules for Islamic banks (Meija *et al.*, 2014). On the contrary, the second approach suggests an entirely independent set of rules is required for Islamic banking because of its specific features, mainly their *Shari'ah* compliance. The third approach incorporates these two approaches and supports the view that, while the Basel framework is adequate in general to regulate Islamic banks, some provisions are still required for Islamic banks, essentially in relation to their religious characteristics.

The empirical findings produced by this study are consistent with the findings of other studies examining the risk-taking behaviour of conventional banks. As regards to the three approaches identified earlier in the literature review section for the regulation of Islamic banks, it can be suggested that the first approach is validated by the empirical findings in this study, namely Basel III is sufficient for also Islamic financial institutions, which therefore suggest that there is no need to determine a set of specific rules for Islamic banks. However, the third approach, which suggests that the Basel framework is adequate in general to regulate Islamic banks, but some provisions should be made for Islamic banks, to respond to *Shari'ah* compliance issues, cannot be dismissed entirely, since this study has not examined the specific risk and regulatory measures of *Shari'ah* compliance.

Another important finding of this study is that a more stable political environment and lower levels of corruption at country-level have positive effects on risk-taking behaviour of Islamic banks. To summarise, the results indicate that more (less) stable political environment and lower (higher) levels of corruption encourage (discourage) risk-taking for Islamic banks. In other words, a stable political environment, better transparency and a more effective application of regulations increase the risk appetite of the Islamic banks in the sample covered by this study.

In searching for the impact of the nature of the banking system on the risk-taking behaviour of Islamic banks, this study found that unlike the Islamic banks operating under the conventional banking system, Islamic banks in the dual banking system countries seem to take a lower risk.

Given these findings, the results of this study should be of interest to market participants, academic researchers and regulatory and supervisory authorities alike by providing the first detailed empirical evidence on the effects of regulatory and supervisory framework on the risk-taking behaviour of Islamic banks in a broader setting, controlling for both firm-specific and country-specific indicators at once.

References

- Agoraki, M. E. K., Delis, M. D., & Pasiouras, F. (2011). Regulations, competition and bank risk-taking in transition countries. *Journal of Financial Stability*, 7(1), 38-48.
- Alam, N. (2012). Efficiency and risk-taking in dual banking system: Evidence from emerging markets. *International Review of Business Research Papers*, 8(4), 94-111.
- Alam, N. (2013). Impact of banking regulation on risk and efficiency in Islamic banking. *Journal of Financial Reporting and Accounting*, 11(1), 29-50.
- Bankscope* (2015). Bureau van Dijk.
- Barth, J. R., Caprio, G., & Levine, R. (2001). *The regulation and supervision of banks around the world: A new database* (Vol. 2588). World Bank Publications.
- Barth, J. R., Caprio Jr, G., & Levine, R. (2004). Bank regulation and supervision: what works best?. *Journal of Financial Intermediation*, 13(2), 205-248.
- Barth, J. R., Caprio, G., & Levine, R. (2008). Bank regulations are changing: For better or worse?. *Comparative Economic Studies*, 50(4), 537-563.
- Beck, T., Demirgüç-Kunt, A., & Levine, R. (2006). Bank concentration, competition, and crises: First results. *Journal of Banking & Finance*, 30(5), 1581-1603.
- Beck, T., Demirgüç-Kunt, A., & Merrouche, O. (2013). Islamic vs. conventional banking: Business model, efficiency and stability. *Journal of Banking & Finance*, 37(2), 433-447.
- Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics*, 87, 115-143.
- Cihak, M., Demirgüç-Kunt, A., Martínez Pería, M. S., & Mohseni-Cheraghloo, A. (2012). *Bank regulation and supervision around the world: a crisis update*. World Bank Policy Research Working Paper No. 6286.
- Demirgüç-Kunt, A., Detragiache, E., & Tressel, T. (2008). Banking on the principles: Compliance with Basel Core Principles and bank soundness. *Journal of Financial Intermediation*, 17(4), 511-542.
- Demirgüç-Kunt, A., Detragiache, E., (2011). Basel core principles and bank soundness: Does compliance matter? *Journal of Financial Stability*, 7, 179-190.

- Fernandez, A., Gonzalez, F., 2005. How accounting and auditing systems can counteract risk shifting of safety nets in banking: some international evidence. *Journal of Financial Stability*, 1, 466–500.
- Fonseca, A. R., & González, F. (2010). How bank capital buffers vary across countries: The influence of cost of deposits, market power and bank regulation. *Journal of Banking & Finance*, 34(4), 892-902.
- Gonzalez, F. (2005). Bank regulation and risk-taking incentives: An international comparison of bank risk. *Journal of Banking & Finance*, 29(5), 1153-1184.
- International Country Risk Guide* (2014). International Country Risk Guide, PRS Group, New York.
- Klomp, J., & Haan, J. D. (2012). Banking risk and regulation: Does one size fit all?. *Journal of Banking & Finance*, 36(12), 3197-3212.
- Konishi, M., & Yasuda, Y. (2004). Factors affecting bank risk taking: Evidence from Japan. *Journal of Banking & Finance*, 28(1), 215-232.
- Laeven, L., & Levine, R. (2009). Bank governance, regulation and risk taking. *Journal of Financial Economics*, 93(2), 259-275.
- Mejia, A.L., Aljabrin, S., Awad, R., Norat, M., & Song, I. (2014). *Regulation and Supervision of Islamic Banks*. IMF Working Paper No. 14/219
- Mohammed, N., Muhammad, J., & Ismail, A. G. (2018). The Degree of Competition in the Malaysian Dual Banking Industry. *Jurnal Ekonomi Malaysia*, 52(3), 71-89.
- Pasiouras, F., Gaganis, C., & Zopounidis, C. (2006). The impact of bank regulations, supervision, market structure, and bank characteristics on individual bank ratings: A cross-country analysis. *Review of Quantitative Finance and Accounting*, 27(4), 403-438.
- Song, I., & Oosthuizen, C. (2014). *Islamic Banking Regulation and Supervision: Survey Results and Challenges*. IMF Working Paper No. 14/220.
- The Banker (2014, November). Special Issue on Islamic Finance. London: Financial Times.
- Tressel, T., & Verdier, T. (2014). *Optimal Prudential Regulation of Banks and the Political Economy of Supervision*. IMF Working Paper No. 14/90.